

Listing of Claims:

1. (Currently Amended) An image reading apparatus
comprising:

a detecting surface ~~on which~~ adapted to have a detecting
object ~~is~~ placed thereon;

5 a sensor array ~~having~~ comprising a plurality of sensors
arranged to read an image pattern of the detecting object placed
on the detecting surface;

10 a first detection electrode, which is provided at least on
~~at least~~ an upper portion of the sensor array, ~~having~~ and which
comprises the detecting surface;

a second detection electrode which comprises a conductive
case member that surrounds the sensor array, the second detection
electrode being ~~provided to be~~ electrically insulated and spaced
apart from the first detection electrode;

15 a counter electrode which is provided ~~to be~~ at a lower side
of the first detection electrode that is on an opposite side of
the first detection electrode from the detecting surface, the
counter electrode being opposite to the lower side of the first
detection electrode ~~through~~ with an interlayer insulating film
20 provided therebetween;

a signal voltage applying circuit which applies a signal
voltage having a first signal waveform that varies periodically

to the counter electrode to excite a second signal waveform to
the first detection electrode through the interlayer insulating
25 film; and

a contact detector which ~~determines~~ comprises a detecting
circuit for detecting a third signal waveform excited to the
second detection electrode upon contact of the detecting object
with both the first detection electrode and the second electrode,
30 the contact detector determining whether the detecting object
brought into contact with the detecting surface is a specific
detecting object based on a voltage level of the third signal
waveform. ~~excited to the second detection electrode according to~~
~~contact of the detecting object with both the first detection~~
35 ~~electrode and the second electrode.~~

2. (Currently Amended) The image reading apparatus
according to claim 1, further comprising a drive controller which
supplies a predetermined drive control signal to each sensor of
the sensor array to perform an image reading operation of the
5 image pattern of the detecting object placed on the detecting
surface.

3. (Currently Amended) The image reading apparatus
according to claim 2, wherein the drive controller controls the
image reading operation based on ~~the determination~~ a result of

the determination by the contact detector of whether the
5 detecting object is the specific detecting object ~~by the contact~~
~~detector.~~

4. (Currently Amended) The image reading apparatus
according to claim 1, wherein each sensor of the sensor array ~~is~~
comprises a photosensor, and the first detection electrode and
interlayer insulating film ~~have transmittance~~ transmit light.

5. (Currently Amended) The image reading apparatus
according to claim 4, wherein the first detection electrode ~~is~~
comprises a transparent conductive film formed on the upper
portion of ~~a light receiving surface of at least~~ the sensor array
5 ~~through~~ with the interlayer insulting film provided between the
upper portion of the sensor array and the transparent conductive
film, and the photosensors receive light through the first
detection electrode and the interlayer insulating film.

6. (Currently Amended) The image reading apparatus
according to claim 5, wherein the transparent conductive film ~~is~~
~~formed of material principally of~~ comprises indium-tin oxide.

7. (Currently Amended) The image reading apparatus
according to claim 1, wherein the first detection electrode ~~is~~

comprises a conductive film formed on the upper portion of the sensor array. ~~, and the second detection electrode is conductive member formed close to at least a part of the surrounding of the~~
5 ~~conductive film.~~

Claim 8 (Canceled).

9. (Currently Amended) The image reading apparatus according to claim 1, wherein the specific detecting object is a part of a human user body, and the image pattern read by the sensor array is an image pattern specific ~~peculiar~~ to the ~~relevant human user is read.~~

10. (Currently Amended) The image reading apparatus according to claim 1, wherein ~~the detecting object is arranged to be laid across~~ the first detection electrode and the second detection electrode are arranged such that the detecting object is laid across the first detection electrode and the second detection electrode to be brought into contact therewith.

11. (Currently Amended) The image reading apparatus according to claim 1, further comprising an amplitude limiting circuit which defines ~~the~~ upper and lower limit voltage values of

the second signal waveform excited to the first detection electrode.

12. (Currently Amended) The image reading apparatus according to claim 11, wherein the amplitude limiting circuit ~~includes at least~~ comprises an anti-parallel diode circuit provided between the first detection electrode and a ground potential, and the amplitude limiting circuit defines the upper and lower limit voltage values of the second signal waveform excited to the first detection electrode based on forward voltages of ~~the~~ respective diodes that form the anti-parallel diode circuit.

13. (Currently Amended) The image reading apparatus according to claim 1, wherein the signal voltage applying circuit applies, to the counter electrode, a signal having a voltage ~~component having a periodical pulse-like signal waveform with~~ predetermined voltage amplitude ~~to the counter electrode~~ and two periodical voltage levels.

14. (Currently Amended) The image reading apparatus according to claim 1, wherein the contact detector determines whether the detecting object is the specific detecting object based on a value of a voltage amplitude and a value of a central

5 voltage of the voltage amplitude of the third signal waveform
excited to the second detection electrode.

15. (Currently Amended) The image reading apparatus
according to claim 1, wherein the contact detector determines
whether the detecting object is the specific detecting object
based on a comparison between: (i) a threshold voltage that is
5 preset based on a capacitance component and a resistance
component of the specific detecting object, and (ii) the third
signal waveform excited to the second detection electrode.

16. (Currently Amended) The image reading apparatus
according to claim 15, wherein the contact detector determines
that the detecting object is the specific detecting object when
the threshold voltage is included within a range of ~~the~~ a voltage
5 amplitude of the third signal waveform excited to the second
detection electrode.

17. (Currently Amended) The image reading apparatus
according to claim 15, wherein the threshold voltage is set to a
voltage that is higher than ~~the~~ an upper limit value of the third
signal waveform excited to the second detection electrode in a
5 state ~~that~~ in which at least the detecting object ~~comes in no~~
does not come into contact with the detecting surface.

18. (Currently Amended) The image reading apparatus according to claim 15, wherein the threshold voltage is set to a voltage that is lower than ~~the~~ a lower limit value of the third signal waveform excited to the second detection electrode in a state ~~that~~ in which at least the detecting object ~~comes in no~~ does not come into contact with the detecting surface.

19. (Currently Amended) The image reading apparatus according to claim 15, wherein the contact detector ~~includes at least~~ comprises a threshold voltage setting circuit that sets the threshold voltage, and a ~~comprising~~ comparing circuit that compares the threshold voltage and the third signal waveform.

20. (Currently Amended) The image reading apparatus according to claim 19, wherein the contact detector determines whether the threshold voltage is included in ~~the~~ a range of ~~the~~ a voltage amplitude of the third signal waveform based on ~~the comparison~~ a result of the comparison by the comparing circuit, and outputs a contact detection signal indicating that the detecting object is the specific detecting object when it is determined that the threshold voltage is included in the range of the voltage amplitude of the third signal waveform.

21. (Currently Amended) The image reading apparatus according to claim 19, wherein the third signal waveform is a waveform that varies periodically, and the contact detector ~~includes~~ comprises means for detecting whether the third signal waveform has passed the threshold voltage ~~level~~, and a count circuit which counts ~~the~~ a number of times that the third signal waveform has passed the threshold voltage ~~level~~, and the contact detector outputs a contact detection signal indicating that the detecting object is the specific detecting object when ~~the~~ a number ~~of continuous count~~ times in a row that the third signal waveform has passed the threshold voltage counted by the count circuit exceeds ~~the~~ a preset number of times.

22. (Currently Amended) The image reading apparatus according to claim 1, wherein the sensors ~~are~~ comprise photosensors, ~~have~~ each of which includes a source electrode and a drain electrode that are formed to sandwich a channel area formed of a semiconductor layer, and a first gate electrode and a second gate electrode that are formed ~~on~~ at least on upper and lower portions of the channel area ~~through each~~ with respective gate insulating ~~film~~, films provided between the gate electrodes and the channel area, and wherein a reset pulse is applied to the first gate electrode to initialize the ~~sensors~~ sensor and a precharge pulse is applied to the drain electrode, thereafter a

read pulse is applied to the second gate ~~, thereby~~ such that an
electrical charge corresponding to ~~the~~ an amount of irradiated
light is stored in the channel area for a charge storing time,
15 which is from ~~the~~ an end of initialization to application of the
read pulse, and a voltage corresponding to the amount of the
stored ~~charges~~ charge is output as an output voltage ~~is output~~ to
the channel area, and the image pattern of the detecting object
placed on the detecting surface is read based on a difference
20 between a signal voltage according to the precharge pulse and the
output voltage.

23. (Currently Amended) The image reading apparatus
according to claim 22, wherein the sensors are formed on an
insulating substrate ~~having transmittance~~ that transmits light, a
protection insulating film is formed on a side of the sensors
5 opposite to the insulating substrate ~~of the sensors~~, and the
interlayer insulating film includes the protection insulating
film and the gate insulating ~~film~~ films.

24. (Currently Amended) The image reading apparatus
according to claim 23, wherein a transparent conductive film is
formed on the protection insulating film, and the first detection
electrode ~~is~~ comprises the transparent conductive film.

25. (Currently Amended) The image reading apparatus according to claim 22, wherein the counter electrode ~~is~~ comprises the drain ~~electrode~~ electrodes, and the first signal voltage applied to the counter electrode by the signal voltage applying circuit is a pulse voltage applied to the drain ~~electrode~~ electrodes.

26. (Original) The image reading apparatus according to claim 25, wherein the pulse voltage is the precharge pulse.

27. (Currently Amended) The image reading apparatus according to claim 22, wherein the sensor array includes a plurality of drain lines connected to the drain ~~electrode~~ electrodes of the photosensors, the counter electrode ~~is~~ comprises the drain ~~electrode~~ electrodes and the drain ~~line~~ lines, and the first signal voltage applied to the counter electrode by the signal voltage applying circuit is a pulse voltage applied to the drain ~~line~~ lines.

28. (Original) The image reading apparatus according to claim 27, wherein the pulse voltage is the precharge pulse.

29. (Currently Amended) The image reading apparatus according to claim 1, wherein a time constant, which is defined

by a resistance component between the detecting surface and ~~the~~ a
ground potential and a capacitance component added to the
5 detecting surface, is set to ~~0.3 μ sec or a smaller value~~ a value
in a range of 0.2 to 0.3 μ sec.

30. (Original) The image reading apparatus according to
claim 29, wherein the resistance component includes electrical
resistance of the first detection electrode.

31. (Currently Amended) The image reading apparatus
according to claim 29, wherein the capacitance component includes
electrostatic capacitance between the first detection electrode
and the counter electrode ~~opposed through the interlayer~~
5 ~~insulating film~~ and between the first detection electrode and the
~~sensor~~ sensors.

32. (Currently Amended) The image reading apparatus
according to claim 29, wherein the time constant is set to ~~0.25~~
 ~~μ sec or a smaller value~~ a value in a range of 0.2 to 0.25 μ sec.

33. (Currently Amended) The image reading apparatus
according to claim 29, wherein the resistance component ~~is set to~~
~~30 Ω or a smaller value~~ has a sheet resistance having a value
of 30 Ω .

34. (Currently Amended) The image reading apparatus according to claim 29, wherein the capacitance component ~~is set to 10 nF or a smaller capacitance value~~ has a capacitance having a value set to approximately 7 to 10 nF.

35. (Currently Amended) The image reading apparatus according to claim 29, wherein each sensor of the sensor array ~~is comprises~~ a photosensor and has a predetermined having a light receiving surface, ~~and~~ the first detection electrode has an area larger than ~~the area of the light receiving surface~~ a light receiving area of the sensor array, and ~~is~~ the first detection electrode comprises a transparent electrode film formed on ~~the~~ an upper portion of the light receiving ~~surface~~ area of the sensor array ~~through~~ with the interlayer insulating film provided between the upper portion of the light receiving area and the transparent electrode film; and

wherein the photosensors receive light in the light receiving area through the first detection electrode and the interlayer insulting film.

36. (Currently Amended) The image reading apparatus according to claim 35, wherein a conductive member having a resistance value that is lower than a resistance value of the transparent conductive film is provided to be electrically

5 connected to an area besides an area corresponding to at least
the a light receiving ~~surface~~ area of the transparent conductive
film.

37. (Original) The image reading apparatus according to
claim 36, wherein the resistance component includes electrical
resistance formed by the transparent conductive film and the
conductive member.

38. (Currently Amended) The image reading apparatus
according to claim 36, wherein the conductive member ~~is formed of~~
~~any one of conductive materials~~ comprises one of chromium,
aluminum, an alloy material containing chromium, and an alloy
material containing aluminum.

39. (Currently Amended) A driving method for driving an
image reading apparatus including a sensor array having a
detecting surface on which a detecting object is placed and a
drive controller which reads an image pattern of the detecting
5 object placed on the detecting surface, the method comprising:
~~the steps of:~~

applying a signal voltage having a first signal waveform
that varies periodically to a counter electrode which is provided
on an upper portion of the sensor array such that the counter

10 electrode is provided at a lower side of a first detection
electrode which comprises the detection surface at an upper side
thereof with an interlayer insulating film provided between the
counter electrode and the first detection electrode, to be
~~opposite to a first detection electrode having the detecting~~
15 ~~surface through an interlayer insulating film to excite a second~~
~~signal waveform to the first detection electrode;~~

detecting a third signal waveform, which is excited to ~~the~~ a
second detection electrode ~~based on~~ upon contact of the detecting
object with both the first detection electrode and the second
20 detection electrode, the second signal electrode comprising a
conductive case member that surrounds the sensor array being
~~provided to be~~ electrically insulated and spaced apart from the
first detection electrode;

determining whether the detecting object brought into
25 contact the detecting surface is a specific detecting object
based on ~~the state~~ a voltage level value of the detected third
signal waveform; and

starting reading of the image pattern by the drive
controller when it is determined that the detecting object is the
30 specific detecting object.

40. (Currently Amended) The driving method for the image
reading apparatus according to claim 39, wherein ~~the step of~~

determining whether the detecting object is ~~[[a]]~~ the specific detecting object ~~includes the step of~~ comprises comparing: (i) a threshold value that is preset based on a capacitance component and a resistance component of the specific detecting object with (ii) the third signal waveform excited to the second detection electrode.

41. (Currently Amended) The driving method for the image reading apparatus according to claim 40, wherein ~~the step of~~ comparing the threshold voltage with the third signal waveform ~~includes the step of~~ comprises determining whether the threshold voltage is included within ~~the~~ a range of voltage amplitude of the third signal waveform, and ~~the step of~~ determining that the detecting object is the specific detecting object when it is determined that the threshold voltage is included within the range of voltage amplitude of the third signal waveform.

42. (Currently Amended) The driving method for the image reading apparatus according to claim 40, wherein ~~the step of~~ comparing the threshold voltage with the third signal waveform ~~includes the step of~~ comprises detecting whether the third signal waveform has passed the threshold voltage ~~level~~, and ~~the step of~~ determining that the detecting object is the specific detecting object when ~~the~~ a number of times in a row that the third signal

waveform has passed the threshold voltage ~~level is counted and~~
~~the number of continuous count times exceeds the~~ a preset number
10 of times.

43. (Currently Amended) The driving method for the image
reading apparatus according to claim 40, wherein the threshold
voltage is set to a voltage that is higher than ~~the~~ an upper
limit value of the third signal waveform excited to the second
5 detection electrode in a state ~~that~~ in which at least the
detecting object ~~comes in no~~ does not come into contact with the
detecting surface.

44. (Currently Amended) The driving method for the image
reading apparatus according to claim 40, wherein the threshold
voltage is set to a voltage that is lower than ~~the~~ a lower limit
value of the third signal waveform excited to the second
5 detection electrode in a state ~~that~~ in which at least the
detecting object ~~comes in no~~ does not come into contact with the
detecting surface.